

Design and Development of Prototype Model of Pneumatic Bench Vice

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ABSTRACT

Pneumatic systems are safer than electromotive systems because they may operate in flammable conditions without igniting or exploding. Overloading a pneumatic system, on the other hand, will merely cause it to slide or stop working. When pneumatic components are overworked, unlike electromotive components, they do not burn or become hot. Pneumatic systems do not emit pollutants when they are in use. The air that is released is also treated differently. As a result, pneumatic systems can work in areas where a high level of cleanliness is required. The production lines for integrated circuits are one example. The Pneumatic plain vice used in drilling machine. Here the loading and unloading is quick. The job can be held more rigidly.

Keywords: PNEUMATIC BENCH VICE, DESIGN AND DRAWINGS BENCH WISE,

I. INTRODUCTION

Pneuma is a Greek word that means "breathing wind." The term pneumatics refers to the study of air movement and phenomena. It is derived from the Greek word pneuma, which means "air." Today pneumatics is mainly understood to mean the application of air as a working medium in industry especially the driving and controlling of machines and equipment.

The moveable jaw is actuated by the screw rod in the mechanical type. The movable jaw is attached to one end, which goes through a fixed type nut. When one end of the screw rod is rotated, it rotates in the nut, which moves the moveable jaw. The reciprocating motion is converted here from the rotational motion.

One end of the piston rod is attached to the moveable jaw in the hydraulic type, and the piston slides in the cylinder. The hydraulic fluid moves the piston, which moves the moveable jaw. Only a reciprocating movement is used here as the main movement. The hydraulic and pneumatic types are the same. Instead of hydraulic fluid, air is employed in this application.

Pneumatics has for some considerable time between used for carrying out the simplest mechanical tasks in more recent times has played a more important role in the development of pneumatic technology for automation.

Pneumatic systems operate on a supply of compressed air which must be made available in sufficient quantity and at a pressure to suit the capacity of the system. When the pneumatic system is being adopted for the first time, however it will indeed be necessary to deal with the question of compressed air supply. Compressor capacity is the actual quantity of air compressed and delivered and the volume expressed is that of the air at intake conditions namely at atmosphere pressure and normal ambient temperature.

The compressibility of the air was first investigated by Robert Boyle in 1662 and that found that the product of pressure and volume of a particular quantity of gas.

The usual written as

$$PV = C \text{ (or) } P_1V_1 = P_2V_2$$

In this equation the pressure is the absolute pressure which for free is about 14.7 Psi and is of course capable of maintaining a column of mercury, nearly 30 inches high in an ordinary barometer. Any gas can be used in pneumatic system but air is the mostly used system now a days

Pneumatic systems use pressurized gases to transmit and control power. Pneumatic systems typically use air as the fluid medium because air is safe, low cost and readily available.

The Advantages of Pneumatics

1. Air used in pneumatic systems can be directly exhausted back in to the surrounding environment and hence the need of special reservoirs and no-leak system designs are eliminated.
2. Pneumatic systems are simple and economical.
3. Control of pneumatic systems is easier.

The Disadvantages of Pneumatics:

1. Pneumatic systems exhibit spongy characteristics due to compressibility of air.
2. Pneumatic pressures are quite low due to compressor design limitations (less than 250 psi)..

II. SELECTION OF PNEUMATICS

Mechanization is broadly defined as the replacement of manual effort by mechanical power. Pneumatic is an attractive medium for low cost mechanization particularly for sequential (or) repetitive operations. Many factories and plants already have a compressed air system, which is capable of providing the power (or) energy requirements and the control system (although equally pneumatic control systems may be economic and can be advantageously applied to other forms of power).

The main advantage of an all-pneumatic system are usually economic and simplicity the latter reducing maintenance to a low level. It can also have outstanding advantages in terms of safety.

III. SELECTION CRITERIA FOR COMPRESSORS

A number of factors are involved in the selection criteria of a suitable air compressor.

These are dealt here briefly

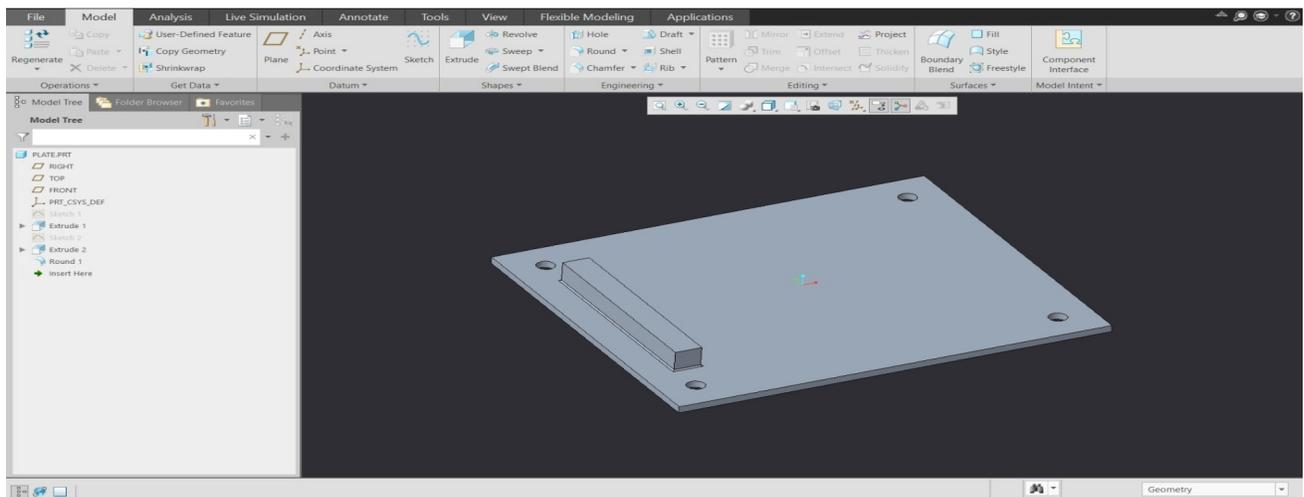
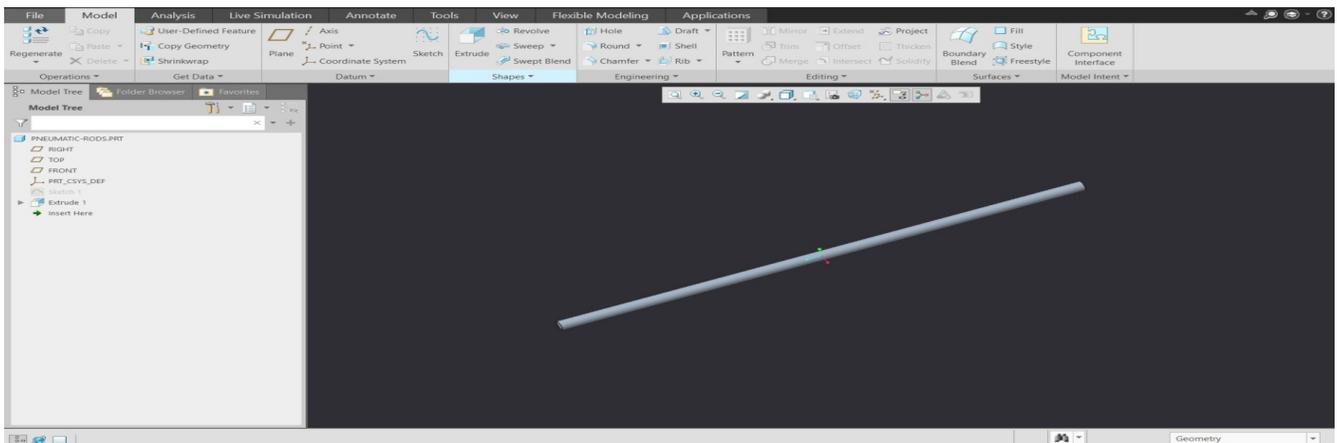
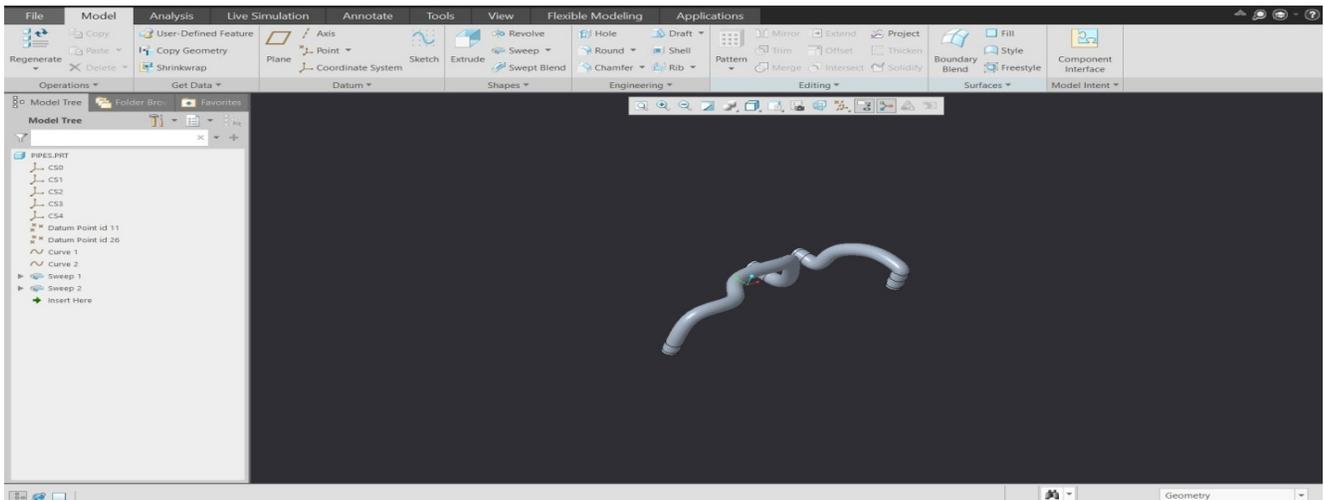
1. Pressure: First of all, the pressure needed must be determined. Most air operated system and tools are designed to operate at a pressure from 6.3105 to 7.3105 N/m². A compressor of normal make and type would normally be suitable if this can assure a pressure 6.3105 N/m² in the distribution line laid down for a pneumatic tools and system.
2. Capacity: Another important factor in compressor selection is the capacity or volume of air required. This factor is sometimes extremely difficult to evaluate.

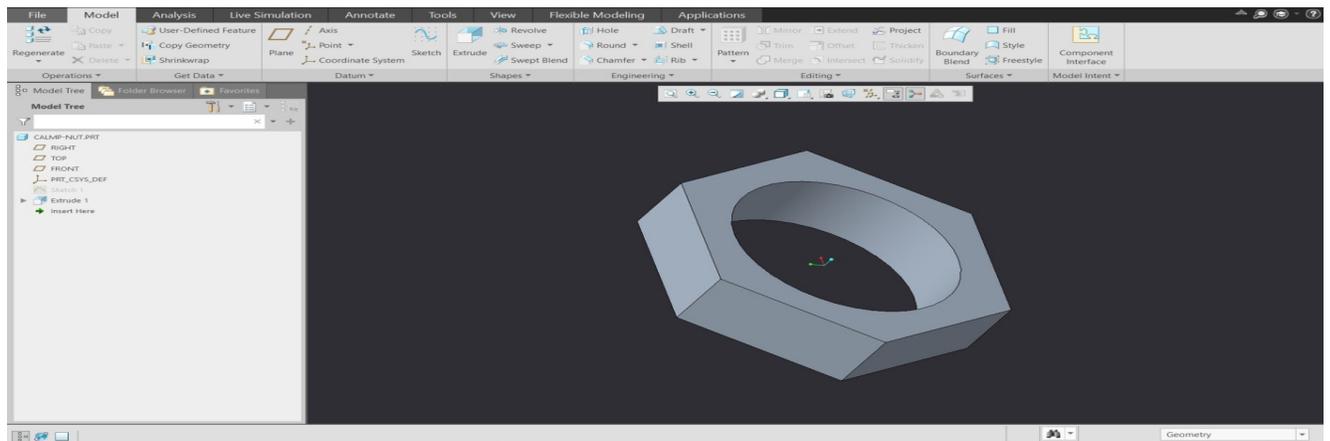
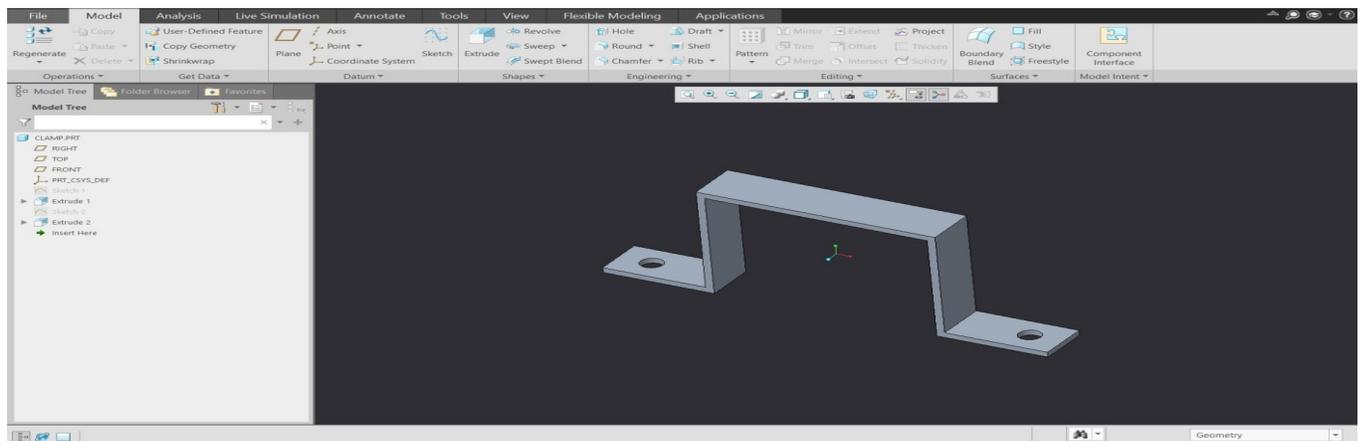
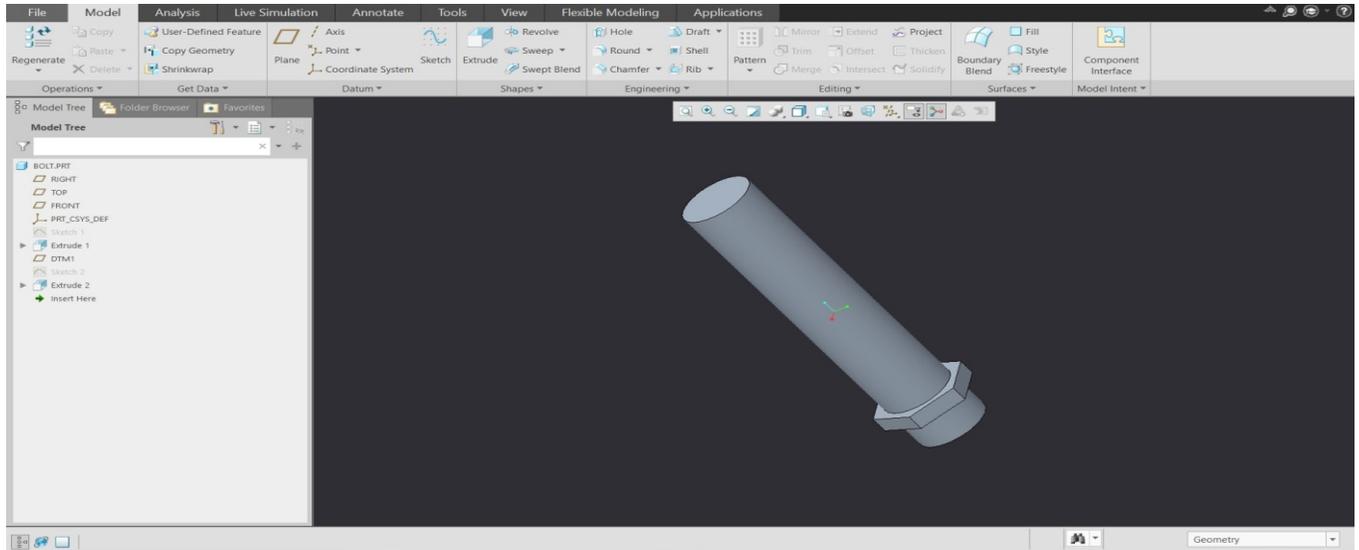
Obviously, the unit selected should be large enough to supply all the air devices, which will be operating at any given time? If all the air operation is continuous, the capacity required is simply the sum of air compression of each individual tool.

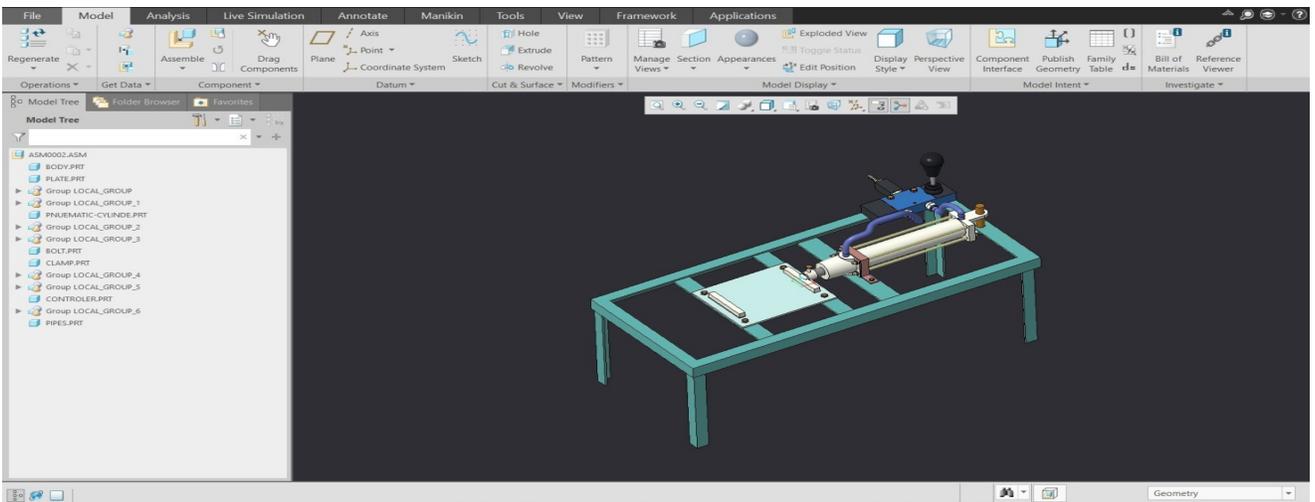
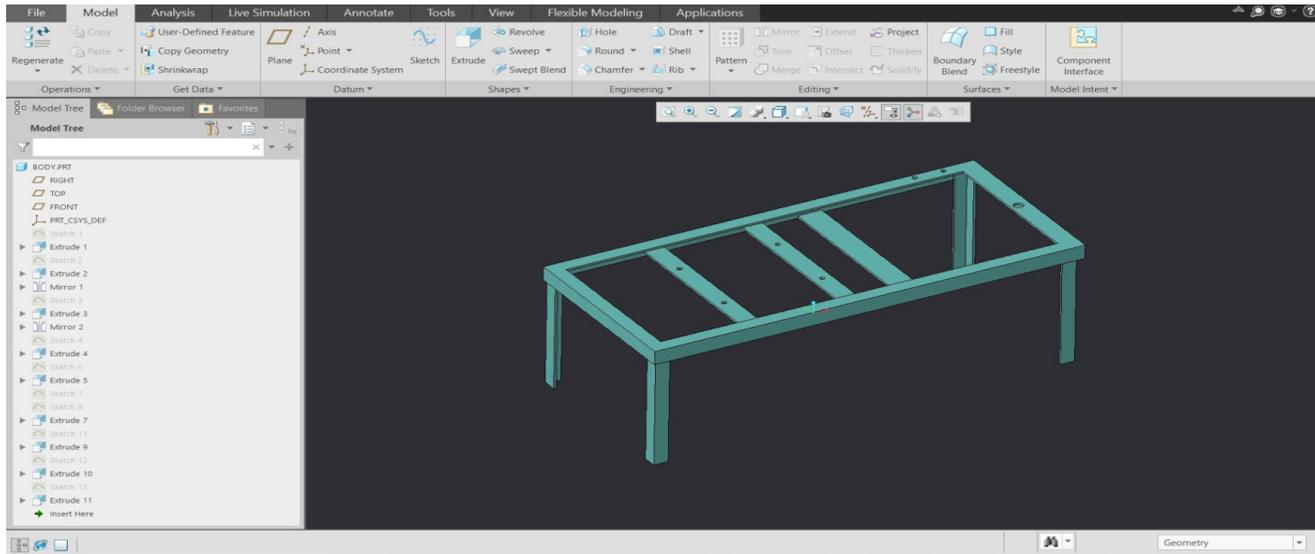
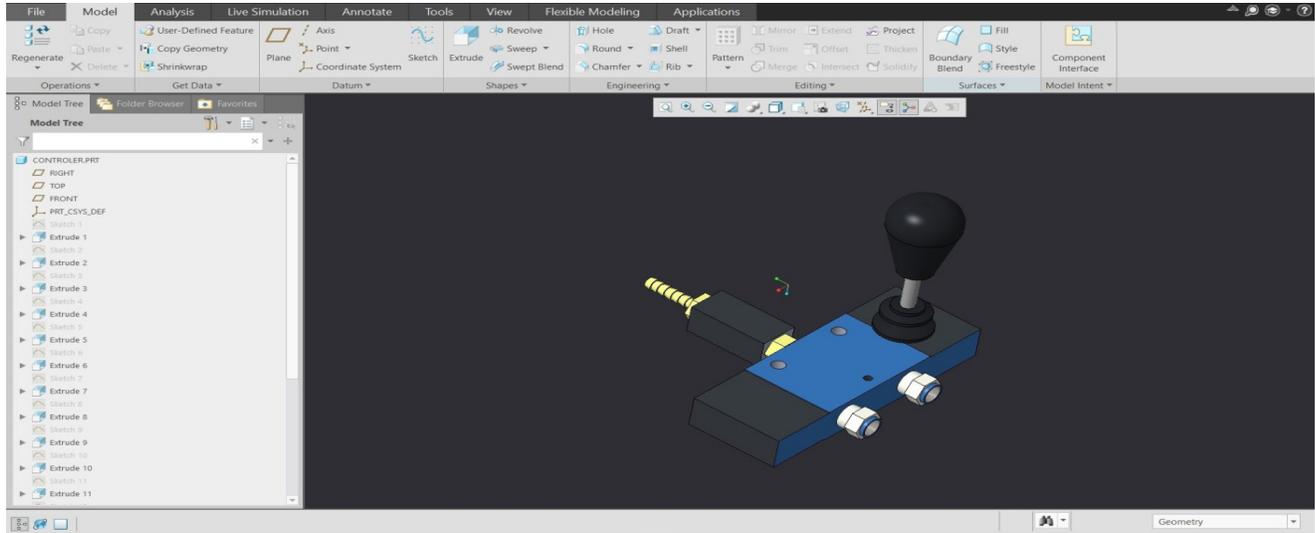
The main function of the air compressor is to compress the air up to the required pressure. The maximum capacity of the compressor is 10.3105 to 12.3105 N/m². This is a two stages or two-cylinder reciprocating air compressor. The two cylinders are for low and high compression. The air pressure is measured at various places by the use of pressure gauges. V-belt and pulley are used to drive the compressor.

3. Pressure Gauge: Pressure gauge is used for measuring the outlet pressure of air from the compressor. The gauge used is Bourdon type pressure gauge. The maximum capacity of this gauge is 10.3105 to 12.3105 N/m². The gauge is fitted at the outlet of the air compressor.

IV. METHODOLOGY







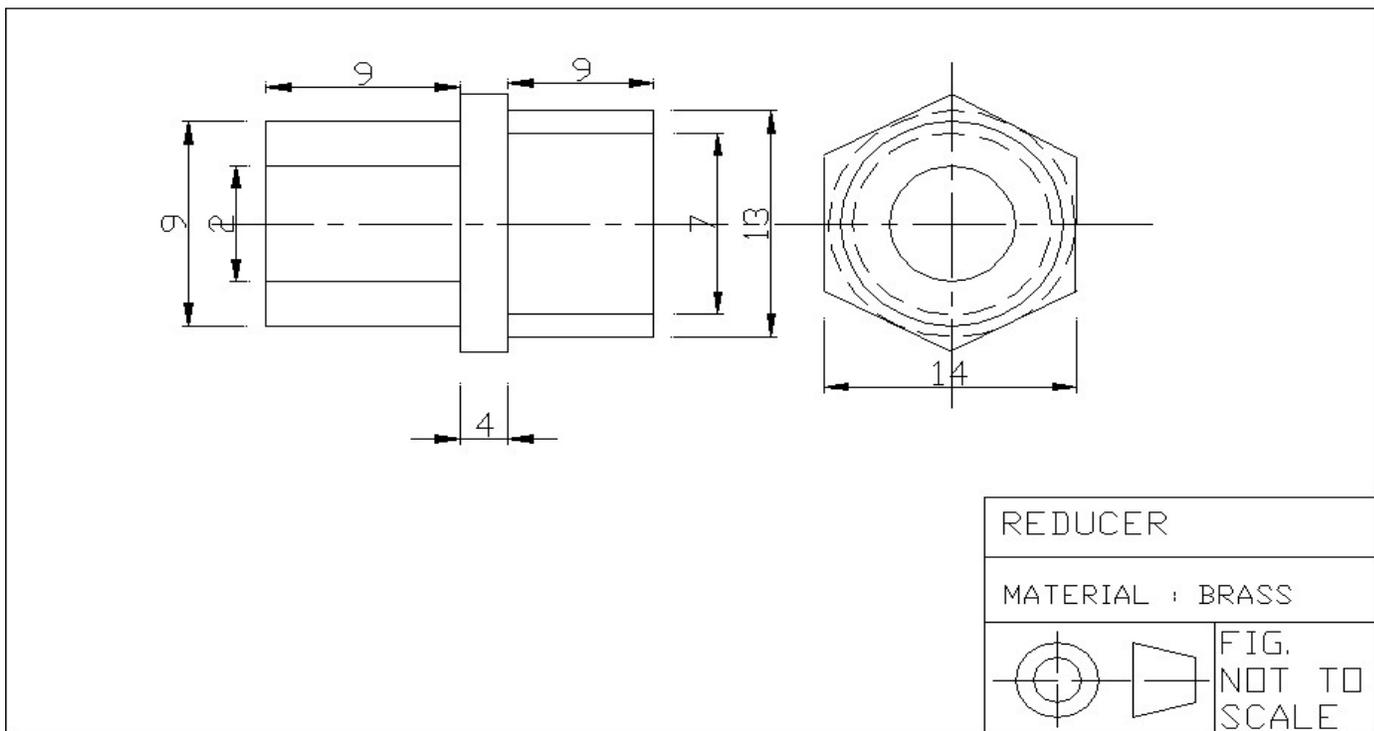
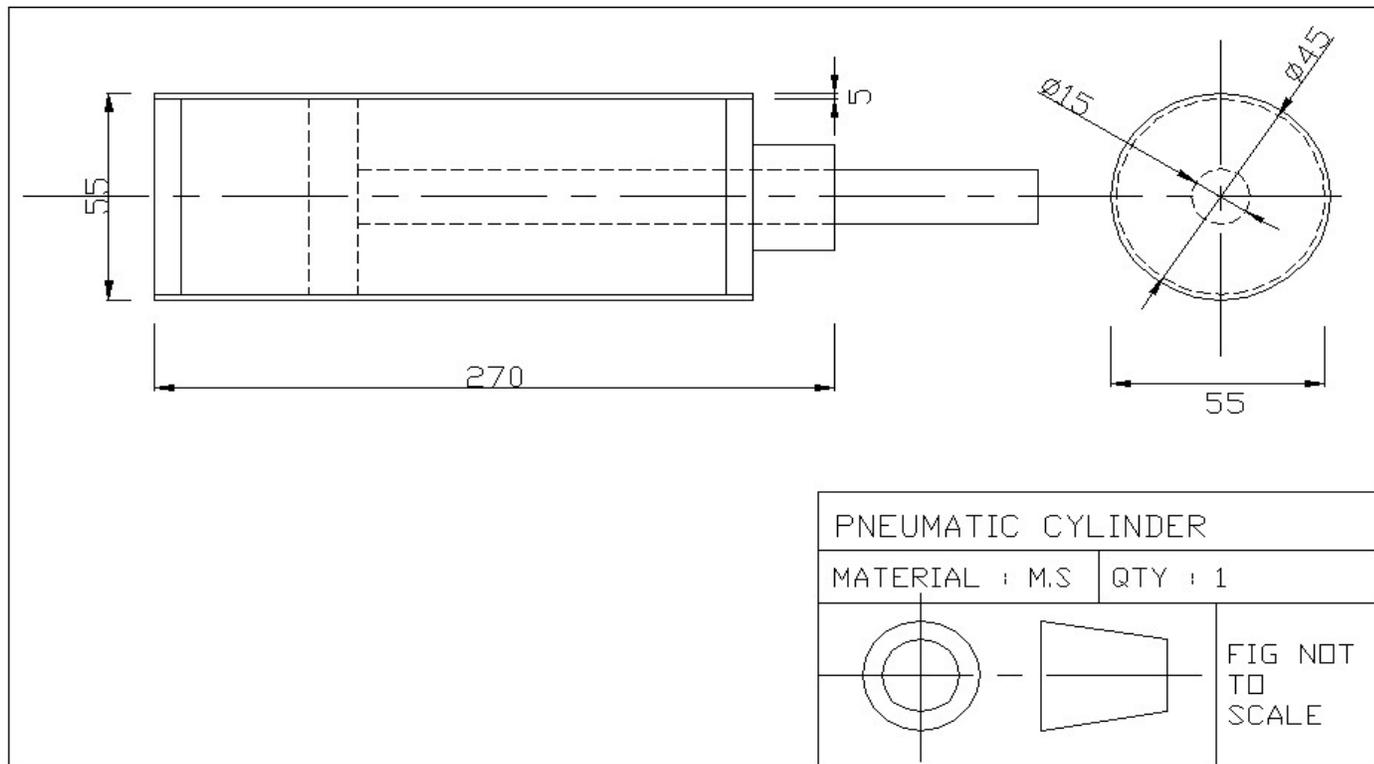


Fig: Detailed Drawing of Pneumatic setup

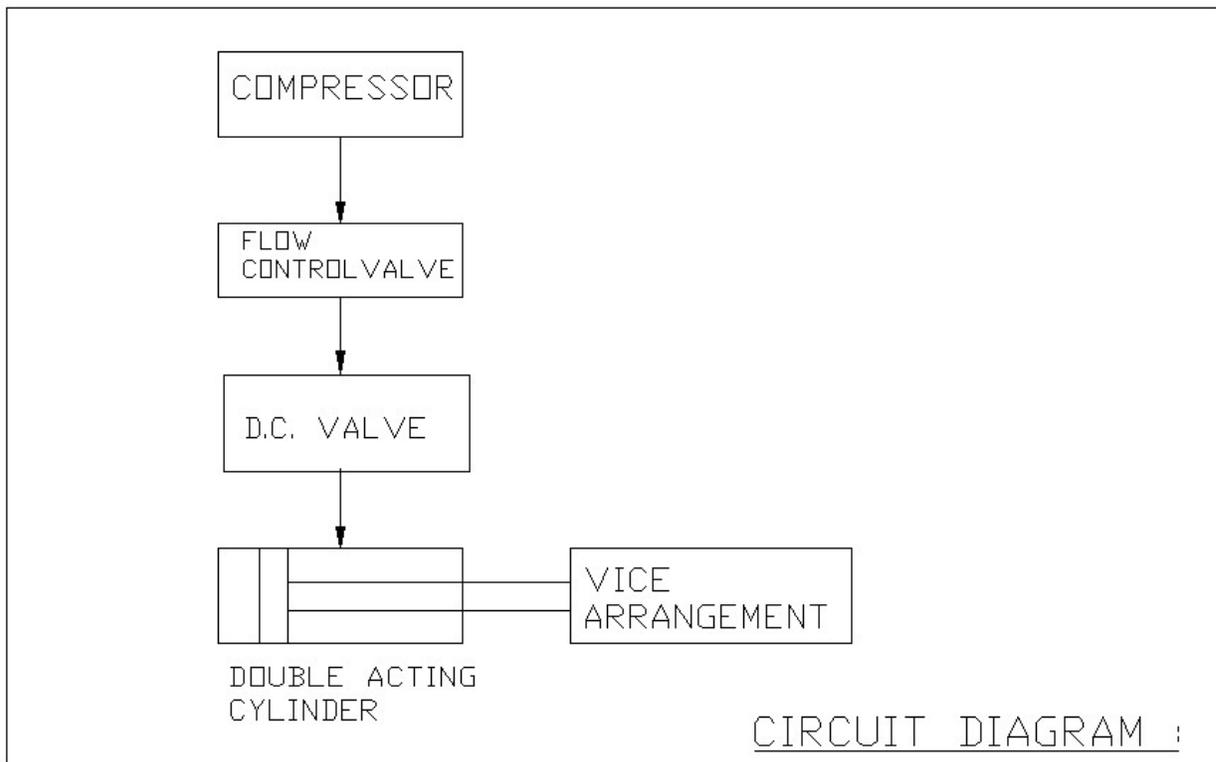


Fig: circuit diagram

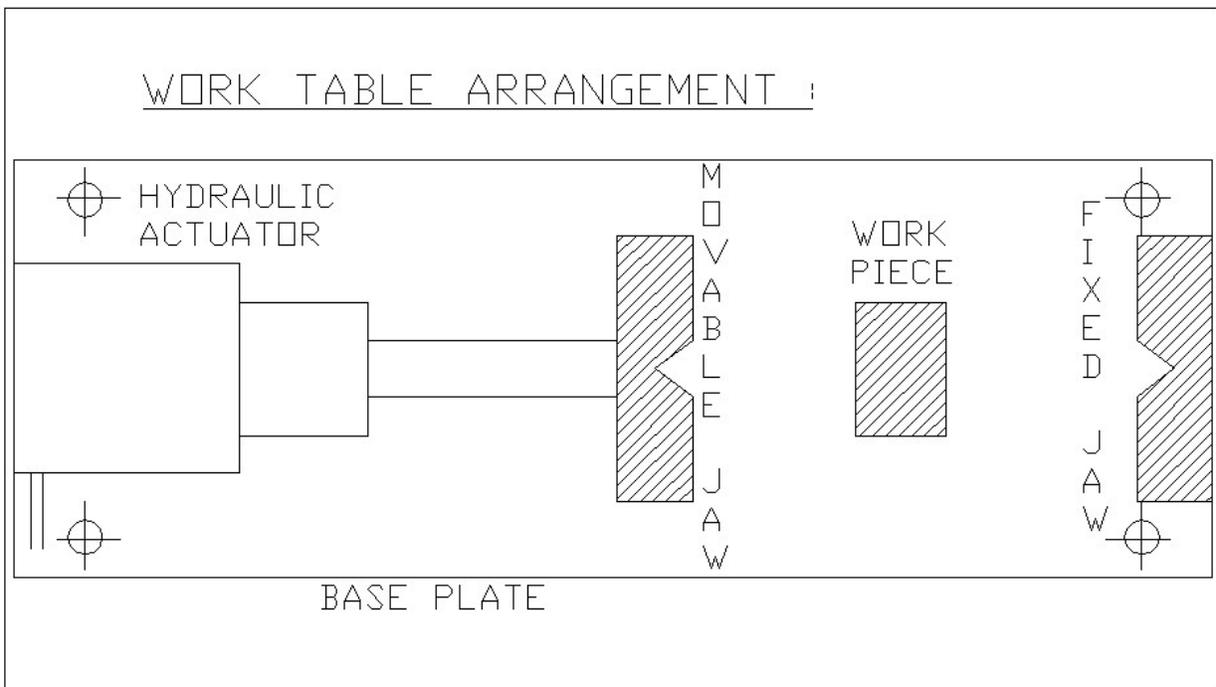


Fig: work table arrangement

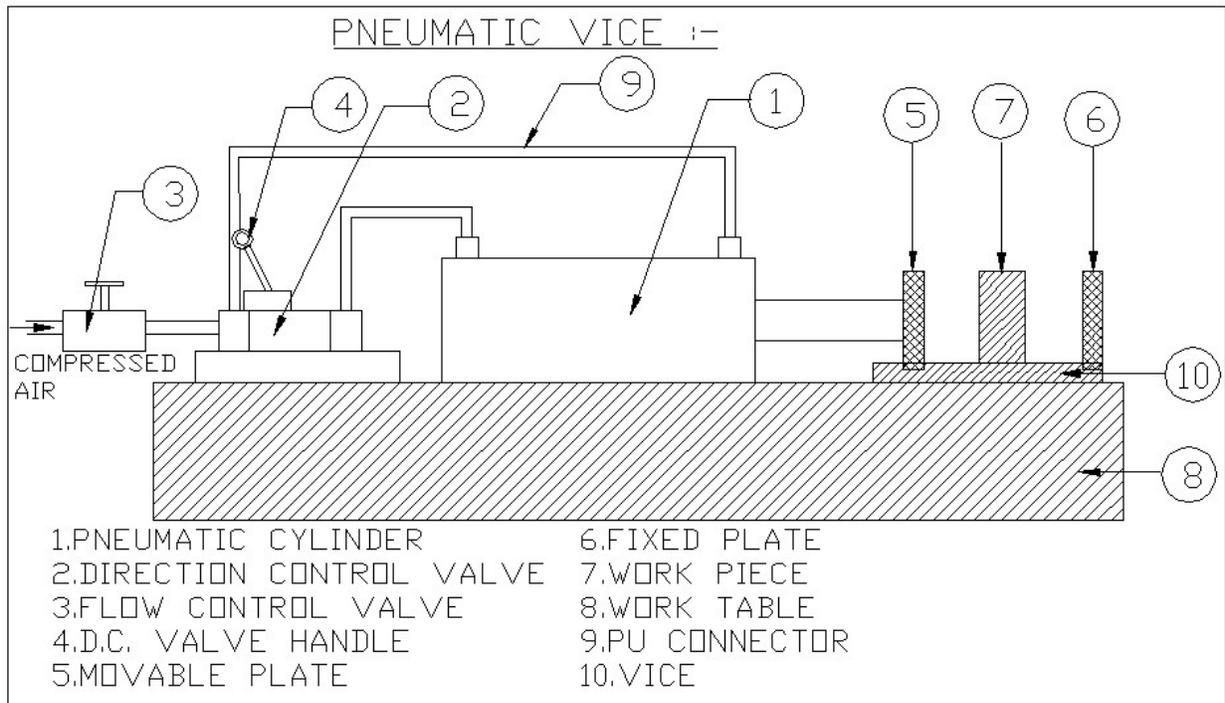


Fig: PROTOTYPE MODEL OF PNEUMATIC BENCH VICE

V.ADVANTAGES AND DISADVANTAGES

ADVANTAGES:

- Idle time of the machine is reduced.
- When compared with the mechanical vices, it consumes less time for clamping and unclamping the job.
- It reduces the manual labour
- Hence, production rate is higher
- In this mechanism there is no backlash.

DISADVANTAGES:

- Initial higher cost.
- May be a choice of air leakage.
- Cylinder stroke length is constant

• VI.APPLICATIONS AND SUGGESTION

APPLICATIONS:

- To hold the job rigidly while machining.
- For quick clamping and unclamping of the job.

SUGGESTION:

This is not only meant for drilling machine vice, using a large capacity cylinder and vice it can be used for clamping and unclamping of the job for most of the machining processes.

VII. CONCLUSION

We conclude that this project made by us will be very helpful to all the machine tools for clamping and unclamping the jobs, it may also be made as a standard available part in the market.

The design of this machine can be improved to reduce further manual work by incorporating the following ideas and attachments.

By incorporating FRL (Filter, Regulator, and Lubrication) unit, the functioning of the machine can be improved.

The hand operated valves can be replaced by solenoid valves.

Limit switches can also be used to get the variable strokes.

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